Assignment 4

ENGINE MAINTENANCE

Textbook Assignment: Engineman 1&C, NAVEDTRA 10543-E1, Pages 3-1 through 3-24

Learning Objective: Describe the procedure and equipments used to inspect and test-run diesel engines.

- Questions 4-1 through 4-4 are to be judged True or False.

4-1. A comparatively minor engine malfunction, if not recognized and remedied in its early stages,never develops into a major casualty.

4-2. Work center personnel must learn to recognize symptoms of developing malfunctions by using the senses of sight, hearing, smell, and touch.

4-3. Because of the safety features which are commonly incorporated in pumps and similar equipment, considerable loss of capacity may occur before any external evidence of damage is apparent.

4-4. When a material failure occurs in any unit, a prompt inspection of all similar units will NOT prevent a wave of similar casualties.

4-5. A spring-balanced indicator uses which of the following types of pistons?

1. Trunk
2. Inverted
3. Ball
4. Check

- Questions 4-6 and 4-7 are to be judged True or False.

4-6. The Kiene indicator is used only to measure the firing pressure of an engine.

4-7. A multivolt meter is used to measure the voltage produced by the thermocouples installed in an engine's exhaust system.

Learning Objective:Specify what maintenance and adjustments are required on temperature regulators, and recognize some of the troubles that may be encountered.

- Question 4-8 is to be judged True or False.

4-8. For maximum temperature control, the bulb of the temperature regulator should always be installed in the inlet side of the engine cooling water piping system.

4-9. At which of the following points should the valve stem of a temperature regulator be lubricated?

1. Where the valve stem enters the stuffing box
2. Around the threaded sleeve used for manual control
3. Both 1 and 2 above
4. At the temperature adjusting wheel

4-10. What should you do if the temperature of the freshwater leaving the engine becomes too high when the regulator is set on the lowest adjustment setting?

1. Make sure that the manual pointer is set at the THERMOSTATIC position
2. Make sure that the packing gland is not binding the valve stem and the valve stem is not stuck in the minimum cooling position
3. Make sure that the temperature control element is operating properly
4. All of the above

4-11. The temperature at the bulb of the temperature regulator drops below the set temperature and the valve position indicator shows COOLER CLOSED. Which of the following remedial measures should you take?

1. Secure the packing gland nut wrench tight
2. Grind the valve seats until a perfect seal is achieved
3. Insert the bulb into the ship's piping in the horizontal position with the arrow on the indicator disk point downward
4. Insert the bulb into the ship's piping in the vertical position with the nut at the top of the unit

4-12. Why should a liquid filled bulb of a temperature regulator be installed either in the vertical position with the nut up or in the horizontal position with the arrow up?

1. To allow the liquid level to be above the end of the internal capillary tube
2. To allow the liquid level to be below the capillary tube
3. To prevent liquid from effecting the bellows
4. To ensure that the arrow on the indicator disk is always pointing upward

When answering questions 4-13 through 4-15, assume you are in the process of adjusting a temperature regulator to the diesel engine freshwater cooling system.

4-13. The manual crankpin should be rotated until the pointer is aligned with which of the following marked positions on the indicator plate?

1. Cooler closed
2. Cooler bypass
3. Thermostatic
4. Each of the above

4-14. When is the indicator slid up or down for adjustment to the proper position?

1. After the lower end of the seating sleeve comes in contact with the lower end of the thermostatic stem
2. Before the lower end of the seating sleeve comes in contact with the lower end of the thermostatic stem
3. After the lower end of the seating sleeve comes in contact with the upper end of the thermostatic stem
4. Before the upper end of the seating sleeve comes in contact with the lower end of the valve stem

4-15. The indicator plate is secured and the pointer and thermostatic center marks are aligned. What is the final valve stem adjustment you should make prior to tightening the locknut?

1. Two complete turns into the thermostatic stem past the seating sleeve contact
2. One complete turn into the thermostatic stem past the seating sleeve contact
3. Two complete turns into the thermostatic stem past the poppet valve seating position
4. One complete turn into the thermostatic stem past the poppet valve seating position

4-16. If the desired temperature of the water in a diesel engine cooling system is 160°F, a properly adjusted temperature regulator will maintain the water at a temperature between

1. 150° and 160°F
2. 150° and 170°F
3. 160° and 170°F
4. 160° and 180°F

Learning Objective: Recognize the purpose and types of heat exchangers; indicate what factors affect their operation; and point out the methods of maintenance and repair.

4-17. In a marine cooling system installation, which of the following engine coolants may be circulated through a heat exchanger?

1. Oil
2. Freshwater
3. Saltwater
4. Both 2 and 3 above

● Question 4-18 is to be judged True or False.

4-18. The two basic types of heat exchangers used on engines are radiator and tubular.

4-19. In the Harrison-type heat exchanger, how do the liquid coolants pass through the unit?

1. Freshwater passes through the tubes, and seawater passes around the tubes
2. Freshwater passes through the tubes, and freshwater passes through the tubes
3. Seawater passes through the tubes, and freshwater passes around the tubes
4. Seawater passes through the tubes, and the seawater passes around tubes

4-20. How is excessive scale on the cooler of a heat exchanger usually indicated?

1. By a slow increase in freshwater temperature
2. By a similiarity between inlet and outlet pressures
3. By the decrease in freshwater temperature
4. By a rise in the freshwater tank level

4-21. The temperature in the saltwater cooling system of an engine should never be allowed to exceed what maximum temperature?

1. 130°F
2. 140°F
3. 170°F
4. 180°F

4-22. Which of the following conditions can cause a cooler element to become clogged with foreign matter?

1. Leak in oil cooler
2. Dirty freshwater
3. Faulty seawater strainers
4. All of the above

● Questions 4-23 is to be judged True or False.

4-23. Overlubrication of the circulating water pump bearings will NOT affect the cooling capacity to the heat exchanger element.

4-24. Erosion holes in the cooler element of a heat exchanger are usually caused by which of the following conditions?

1. A clogged cooler element
2. A low-pressure water flow
3. Air entrapped in the cooler casing
4. Fast movement of grit particles

4-25. By which of the following actions will you cause internal leaks of a heat exchanger element installed in the engine cooling system?

1. By increasing the oil temperature of the cooler
2. By reducing the water pressure to the cooler
3. By allowing continued cooler operation at excessive pressure
4. By allowing continued cooler operation at reduced pressure

4-26. The heat exchanger outlet side is used to admit the proper amount of steam required to blow through a clogged cooler element containing which of the following deposits?

1. Oil
2. Sand
3. Grease
4. Roth 2 and 3 above

4-27. YOU are performing an air test on a heat exchanger to check for leaks. What should you do after attaching a pressure gage to the inlet line of the element?

1. Immerse the element in a tank of water
2. Block off the discharge side of the element
3. Admit low-pressure air to the inlet side of the element
4. Remove the element from the casing

4-28. Which of the following methods should you use to make an emergency repair to a strut-type heat exchanger?

1. Plug the tube
2. Replace the element
3. Soft solder the element
4. Silver solder the element

4-29. How should you make emergency repairs to a leaky tube of a shell in a tube-type oil cooler?

1. Plug the tube at both ends with a special plug
2. Plug the tube at both ends with a strip of neoprene
3. Seal the tube with soft solder
4. Seal the tube with solder at the inlet end only

4-30. Shell-and-tube-type heat exchangers are cleaned by which of the following methods?

1. Air lances, steam sprays, or chemical solutions
2. Steam sprays or chemical solutions only
3. Air or water lances only
4. Chemical solutions, air lances, or water lances

Learning Objective: Recognize casualties pertaining to lubricating systems and point out how they may be avoided.

● Question 4-31 is to be judged True or False.

4-31. If you will use the proper type of lube oil in an engine lubricating oil system you will ensure that all engine parts receive sufficient lubrication.

4-32. Pressure in the lubricating system is maintained by which of the following devices?

1. Relief valves
2. External relief valves
3. Internal pressure regulating valves
4. All of the above

4-33. Which of the following conditions indicate a broken lube oil pump?

1. Smoke rising from the shaft
2. Abnormal noise in the pump
3. Sudden increase of lube oil pressure
4. Fluctuation of lube oil pressure

4-34. When is the low-pressure warning device of a lube oi 1 system usually tested?

1. Every day
2. When the system is started and secured
3. Only when the system is started
4. Only when the system is secured

4-35. In addition to temperature and pressure readings, which of the following methods should you use to determine if a bearing is receiving oil?

1. After shutdown, inspect bearings to determine the pressure of the oil
2. After shutdown, place you hand on a bearing to note the temperature
3. Both 1 and 2 above
4. Blow air through lube oil passages

4-36. Which of the following materials should you use when cleaning an engine lube oil sump?

1. Cotton waste
2. Paper towels
3. Lintfree cloths
4. All of the above

4-37. You have removed an oil filter line from an engine. Before reinstalling, the line should be cleared of any obstructions with

1. diesel oil
2. compressed air
3. low-pressure steam
4. freshwater lances

Learning Objective: Explain the operational characteristics of fuel injection equipment and engine controls. Recognize symptoms of fuel injection trouble and their causes, and indicate what corrective measures may be required.

4-38. Regardless of design, under which of the following conditions should solid fuel injection systems deliver the fuel oil to each engine cylinder?

1. At a high pressure
2. In the correct amounts
3. At the proper time
4. All of the above

4-39. What are the two general types of solid fuel injection systems?

1. Unit injection and common rail
2. Jerk pump and common rail
3. Individual pump and jerk pump
4. Unit injection and individual pump

● Question 4-40 is to be judged True or False.

4-40. The pump-injection system that combines a high-pressure pump and fuel injection nozzle into one unit is called a unit injector.

4-41. Which of the following injection systems uses a metering device that delivers the appropriate amount of fuel to each injector?

1. Atlas
2. Cooper-Bessemer
3. Bosch
4. Cummins

4-42. Which of the following factor(s) control(s) the amount of fuel that is injected by the cam-operated injector valves of the basic common-rail injection system?

1. The length of time the nozzle stays open
2. The pressure held by the high-pressure pump in the common rail
3. The action of the individual valves mounted on the side of the engine
4. The length of time the nozzle remains open and by the pressure held by the high-pressure pump in the common rail

● Question 4-43 is to be judged True or False.

4-43. Most diesel injection equipment operating problems are resolved when clean fuel is used.

4-44. Which of the following is the best method to determine whether the bushing assembly of a unit injector has been damaged?

1. Place the injector in a test stand and test the bushing assembly
2. Install the injector in a test engine, operate the engine, and check for low firing pressure
3. Disassemble the injector, clean it, and inspect each part of the bushing assembly
4. Install the injector in a test engine, operate the engine, and check for low exhaust temperature

4-45. Which of the following operations is affected by irregularities in the surface and helix edge of a plunger?

1. Pumping
2. Metering
3. Combustion
4. Firing

4-46. If the lapped surfaces of a plunger and barrel assembly are exposed to atmospheric dust, the surfaces will

1. erode
2. rust
3. score
4. bind

● Questions 4-47 and 4-48 are to be judged True or False.

4-47. Some fuel oil systems have additional safety filters or screens located between the fuel transfer pump and the fuel distributor.

4-48. The absorbent qualities of cotton waste make it an excellent drying agent for fuel injector parts.

4-49. Lapped surfaces should be handled only after they have been

1. allowed to dry at room temperature
2. immersed in clean diesel oil
3. washed in distilled water
4. dried by heat for several minutes

4-50. External leakage of diesel fuel from pumps and injectors is probably caused by which of the following conditions?

1. Loose connections, scored plungers, or cracked housings
2. Scored plungers, improper assembly, or broken springs
3. Eroded bushing ports, loose connections, or broken springs
4. Improper assembly, loose connections, or cracked housings

4-51. On some fuel injection equipment, mild roughness and discoloration of the sealing surfaces may be removed by which of the following methods?

1. Lapping
2. Scrapping
3. Grinding
4. Honing

4-52. When the plunger of the injection pump of a diesel engine is stuck, it usually causes which of the following conditions?

1. Engine failure
2. Excessive fuel consumption
3. Increase in engine temperature
4. Failure of a cylinder to fire

4-53. A binding plunger test is being performed. What kind of trouble is indicated by a sluggish return of the plunger?

1. A broken plunger spring
2. A sticky plunger
3. A nicked plunger
4. A scored plunger

4-54. In trying to loosen a stuck fuel oil injector plunger, you should soak the plunger and barrel in which of the following fluids?

1. Clean diesel fuel
2. Lubricating oil
3. Cleaning solvent
4. Unleaded gasoline

4-55. You are cleaning a Bosch fuel injection pump plunger. What should you do after rinsing it in fuel oil and blowing it dry?

1. Examine the plunger for defects
2. Reassemble the pump assembly
3. Place mutton tallow on the plunger
4. Wipe the plunger with a mild abrasive

4-56. Which of the following materials should NOT be used to free up the plunger and bushing to a G.M. unit injector?

1. Jewelers' rouge
2. Mutton tallow
3. Clean fuel oil
4. Compressed air

4-57. In a diesel engine fuel system, what is the function of the fuel control rack?

1. To control vaporization of fuel
2. To remove impurities from the fuel
3. To meter the fuel injected at each stroke
4. To prevent jamming of the fuel injector plunger

4-58. Which of the following conditions causes an engine fuel oil control rack to stick?

1. End play
2. Normal wear
3. Gear backlash
4. Dirt in the mechanism

4-59. What effect, if any, may backlash in the control rack have on engine performance?

1. High exhaust temperature
2. Low firing pressures
3. Variations in speed
4. None

4-60. Backlash in the fuel control system is often caused by which of the following parts?

1. Jammed control rack
2. Scored pump plunger
3. Distorted pump bushing
4. Worn control sleeve

Learning Objective: Discuss the operational characteristics of fuel injection equipment and engine controls. Recognize symptoms of fuel injection troubles, as well as their causes, and indicate corrective measures that may be required.

● Question 4-61 is to be judged True or False.

4-61. Improper seating of the exhaust valves may cause symptoms similiar to improper timing of the engine fuel injection system.

4-62. Late timing of fuel being injected into a cylinder may be indicated by which of the following conditions?

1. Engine detonation
2. Injection pump, leakage
3. High exhaust temperature
4. Low exhaust temperature

4-63. Which of the following factors may be the cause for a Bosch fuel injector pump to go out of timing?

1. A broken spring
2. A stuck plunger
3. A worn pump camshaft
4. An eroded spill port

4-64. Which of the following corrective measures could you use to reduce the number of engine governor difficulties?

1. Reduce the engine speed
2. Increase the engine load
3. Use clean oil
4. Adjust the fuel linkage

● Questions 4-65 and 4-66 are to be judged True or False.

4-65. To maintain the proper oil level in the engine governor, you may use lubricating oil from the main diesel engine crankcase.

4-66. Foaming of the oil indicates presence of water in an engine governor.

4-67. When the governor compensating needle valve is correctly adjusted, how should the engine behave during load changes?

1. Maintain low underspeeds
2. Maintain high overspeeds
3. Return slowly to normal speeds
4. Return quickly to normal speeds

4-68. An increase in load for any constant throttle setting of a mechanical governor will be accompanied by a decrease in

1. engine speed
2. spring length
3. fuel pressure
4. oil temperature

● Question 4-69 is to be judged True or False.

4-69. Hydraulic rather than mechanical governors are used where extremely accurate engine speed regulations are required.

4-70. What type of governor is designed to hold the predetermined operating speed of a diesel engine generator set?

1. Load-limiting
2. Variable-speed
3. Speed-limiting
4. Constant-speed

4-71. The mechanical governor controls engine idling speed when the centrifugal force of both sets of flyweights act against which of the following parts?

1. The buffer spring
2. The light spring
3. The heavy spring
4. All of the above

4-72. Which of the following conditions may cause an improper speed fluctuation of an engine equipped with a mechanical governor?

1. Constantly changing loads
2. Misfiring engine cylinders
3. A binding governor linkage
4. Each of the above

4-73. An overspeed trip will stop a diesel engine that is equipped with a speed governor when the regular speed governor fails to

1. limit the load on the engine
2. keep the engine within its maximum designed limit
3. operate
4. reduce engine hunt

● Question 4-74 is to be judged True or False.

4-74. Prior to testing the engine overspeed trip, the accuracy of the engine tachometer should be checked for proper operation as required by the manufacturer's instructions.

4-75. A broken drive shaft of a hydraulic overspeed trip will cause uncontrolled engine speed because the flyweights

1. disconnect from the shaft
2. remain in a distended position
3. cease to exert centrifugal force
4. increase in rotative speed